


A 1.5 h course to be held at the JRC Ispra at the 5th International Summer School 2013:  
*Operational Issues in Radioactive Waste Management and Nuclear Decommissioning*

# Nucleonica “Lab”: An Overview of the Nuclear Science Portal with “hands-on” exercises

Dr. Joseph Magill,  
Nucleonica GmbH,  
Karlsruhe



The screenshot displays the Nucleonica website interface. At the top, the header includes the Nucleonica logo, the tagline "... web driven nuclear science", and navigation links: Home | Sitemap | About us | Privacy Statement | Legal Notice. The date "Saturday, June 30, 2012" is shown on the right. Below the header, there is a login section with fields for "username" and "password", and buttons for "Login" and "AutoLogin".

The main content area is divided into three columns. The left column contains a "Welcome" message and a list of links: "Free Access", "Premium Membership", "Our Customers", "Nucleonica [blog]", "Nucleonica [wiki]", "Forum", "Karlsruhe Nuclide Chart", "..... Online Shop", "Educational Resources", "Training Courses", "Ask an Expert", "FAQ", "About Us", "Contact", and "Impressum".

The central column features a large image of a hand pointing at a grid of colored squares (yellow, red, blue, green). Below the image, the section "What is Nucleonica?" is followed by three bullet points:

- » Nucleonica is an innovative professional and technical resource for knowledge creation and competence building for the worldwide nuclear science community. The portal has grown to become the leading online resource nuclear sciences and is particularly suitable for education and training of scientists, engineers and technicians in the nuclear domain. Our application enable researchers and specialists to make complex and precise calculations in state-of-the-art fashion.
- » Nucleonica is aimed at scientists, engineers and technical personnel working in the fields of nuclear power, health physics, radiation protection, nuclear and radiochemistry, decommissioning, nuclear medicine, etc. It can be used by professionals for everyday calculations, obtaining quick results and testing, validating and verifying complex computer models.
- » Nucleonica provides you with user-friendly access to the latest reference data from internationally evaluated nuclear data. A unique feature is the wide range of web-based nuclear science applications. A variety of social networking tools are provided for scientific collaboration. In addition, Nucleonica offers a range

The right column is titled "NUCLEAR NEWS" and contains two articles:

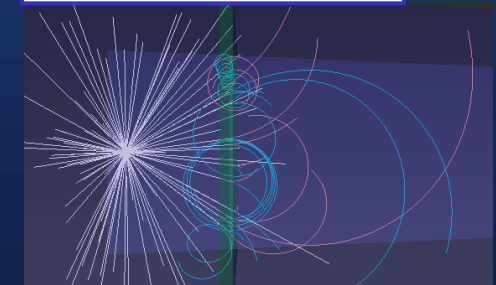
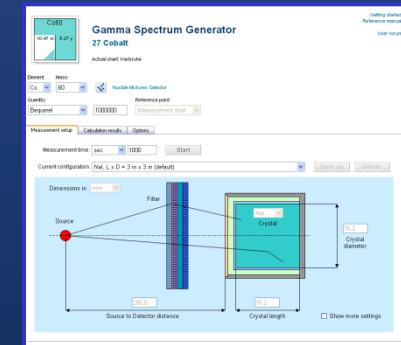
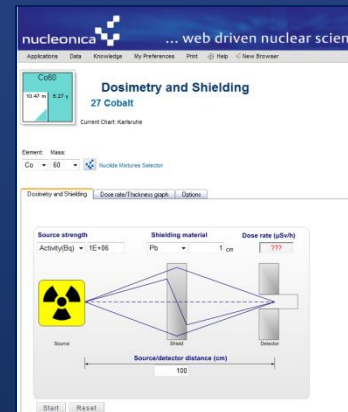
- New telescope to guard Earth from killer asteroids**  
JUN 30 Some 500,000 asteroids are circulating near-Earth space and some of them may pose a real danger to our planet. But a US company says it plans to build a telescope that will be able to watch them. Read [...]
- U.N. publishes report on Iran arms trade with Syria**  
JUN 30 UNITED NATIONS (Reuters) - A U.N. Security Council committee has published a report on Iranian sanctions violations, including shipments of weapons to Syria in breach of a U.N. ban on weapons exports [...]

At the bottom left, there is a section titled "NUCLEONICA HOT TOPICS" with a sub-header "» New Virtual Cloud Chamber" dated "November 10, 2011". The text below reads: "We announce the release of a new Nucleonica module: the Virtual Cloud Chamber. This powerful application is an online interactive simulation tool for investigating the

# Nucleonica: Web-based Software Tools for Simulation and Analysis



- Nuclear Data Resources in Nucleonica
- Nuclear Science Applications & Tools
  - Decay Engine
  - Dosimetry & Shielding
  - Virtual Cloud Chamber
  - Gamma Spectrum Generator
  - webKORIGEN
  - e-Ship
- Education & Training with Nucleonica
  - Nucleonica Mobile
  - Karlsruhe Nuclide Chart
- Knowledge Management with Nucleonica



These lectures are available online:

[http://www.nucleonica.com/wiki/index.php?title=Training\\_Course\\_Proceedings](http://www.nucleonica.com/wiki/index.php?title=Training_Course_Proceedings)

## Previous Training Courses

### Sept. 2013 Ispra, Italy

**Nucleonica “Lab”: An Overview of the Nuclear Science Portal with “hands-on” exercises at the 5th International Summer School 2013 - *Operational Issues in Radioactive Waste Management and Nuclear Decommissioning*, Ispra 9-13 Sept. 2013.**

This year, the Ispra summer school is organised around several technical sessions and will feature five visits to JRC-ISPRAs laboratories that are involved in decommissioning and nuclear and radioactive waste management. During these visits, participants will be invited to assist in some real measurements. The Nucleonica training sessions will form one such “laboratory” where participants can learn how to use Nucleonica applications effectively in this area. During the course of the week, four 1.5 h Nucleonica “lab” sessions will be held each afternoon.

Links to the presentations:

Nucleonica Overview (J. Magill)

Case Study: Characterisation of an Irradiated fuel sample (UOX) from a PWR

A: Calculate the activities of actinide and fission products in the sample (webKORIGEN)

B: Create a nuclide mixture of the 10 nuclides with highest activities (Nuclide Mixtures)

C: Estimate the gamma dose rate from this material – both unshielded and shielded (Dosimetry & Shielding)


D: Generate the gamma spectrum for a HPGe detector (Gamma Spectrum Generator) and identify the main lines.

E: Generate a transport report to determine which type of packaging is required to transport this sample (e-Ship)

Nucleonica Tips & Tricks (J. Magill)

Nucleonica brochure 



JRC Ispra: location of the 5th International Summer School 2013:   
*Operational Issues in Radioactive Waste Management and Nuclear Decommissioning*

Links to the presentations:

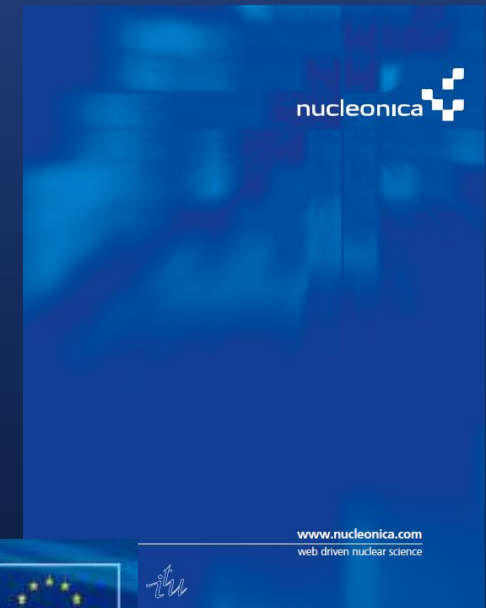
- go to wiki on main Nucleonica page

- click on Training Courses

- at bottom of page click on Training Course Proceedings

# How can Nucleonica help you?

- Nucleonica provides you with user friendly access to the latest reference data from internationally evaluated nuclear data.
- A unique feature is the wide range of validated web-based nuclear science applications for decay calculations, dosimetry & shielding, gamma spectrometry, etc.
- In addition Nucleonica offers a range of introductory and advanced training courses in various areas of nuclear science.



*Handwritten signature*



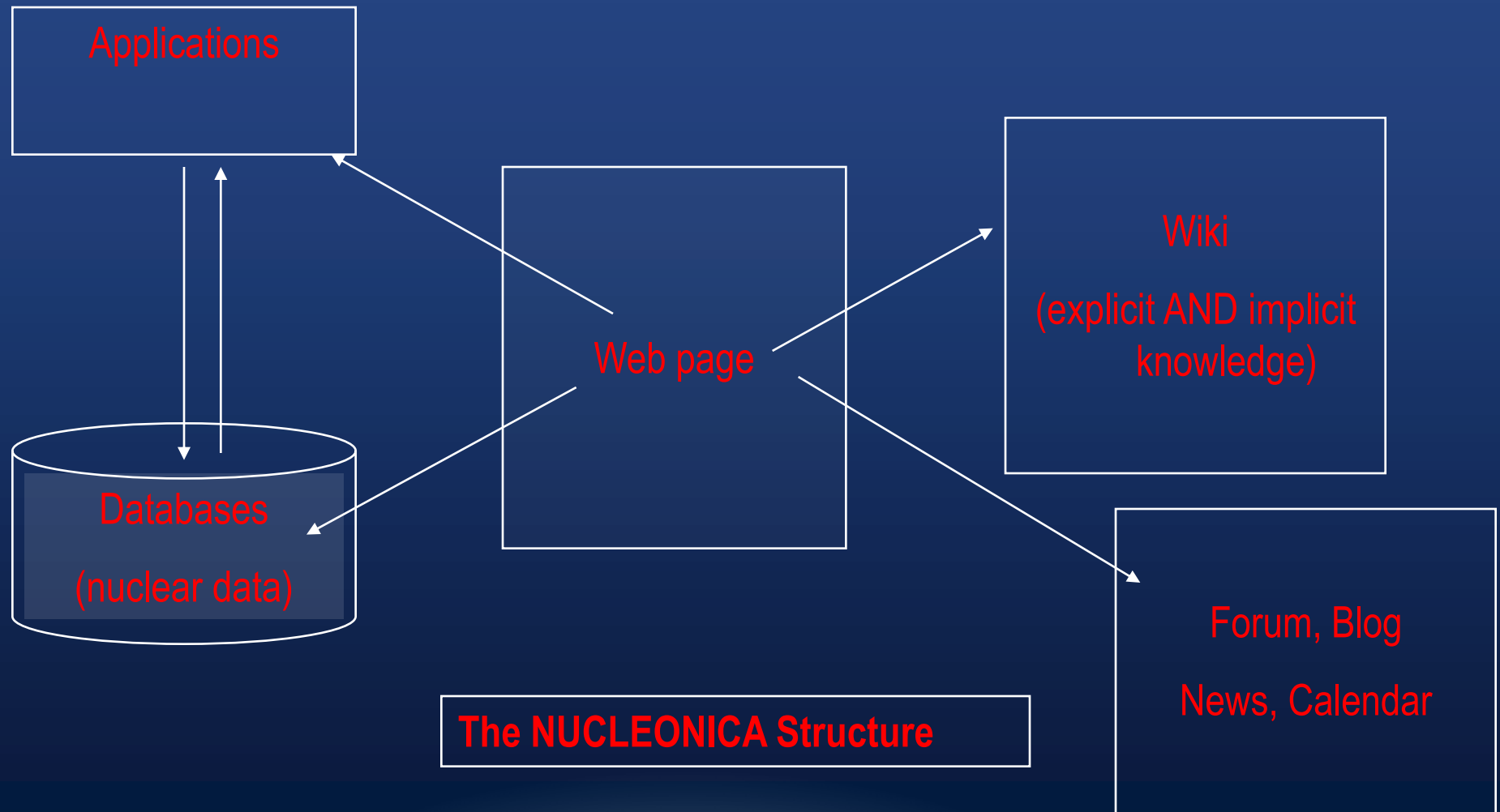


Nucleonica is already being used by thousands of scientists and students worldwide in over 92 countries. Due to its advanced IT features, user friendly and intuitive environment, the platform has recently been endorsed by the Sustainable Nuclear Energy Technology Platform ([www.snetp.eu](http://www.snetp.eu)):



*“Nucleonica plays ... an important role in making nuclear education more attractive and in building nuclear knowledge for a new generation of engineers and scientists”*

# Nucleonica Architecture & Logical Structure...



# Nuclear Data Resources in Nucleonica: Nuclide Datasheets++

Version: 2013.07.26 10:38:01

**Nuclide Datasheets++**  
27 Cobalt

Questions, remarks, suggestions can be posted in the forum

Current Chart: Karlsruhe

Element: Co Mass: 60

CPU-Time / Total-Time: 2.9 / 5.1 sec

Reference Data Options Radiations Description Derived Data Cross Sections Prompt Gammas

> Nucleonica Databases

Compare Databases:

	JEFF-3.1	ENDF/B-VII.1	Nubase 2003	Nubase 2012	ICRP-72
<b>60</b> <b>27</b> <b>Co</b> <sub>33</sub>					
Density					
Mass Excess			-81649.012 (± 828) keV	-81649.720 (± 523) keV	
Atomic Mass			59.933817059 (± 874) u	59.933816299 (± 561) u	
Half-life	5.271 (± 1) y	5.2712000 (± 3833) y	5.2713 y 0.0008	5.2712 y 0.0004	
Spin	5 h	5 h	5+	5+	
Parity	+	+			
Binding Energy			8.74675 MeV/nucleon		
Abundance			-		
Effective Dose Coefficient Inhalation					
Effective Dose Coefficient Ingestion					
Mean Decay Energies					
Alpha	0 (MeV)	0 MeV			
Electron	96.7734 (keV)	96.7691 keV			
Photon	2503.84 (keV)	2503.84 keV			
Decay					
Co60 (β-) 28 Ni 60					
Branching ratio	1	1			
Decay Energy, Q	2.8239 (MeV)	2.8239 (MeV)			
Decay Production					
27 Co 60m (IT) Co60					
Branching ratio	0.9975	0.9976			
Decay Energy, Q	0.0586 (MeV)	0.058603 (MeV)			

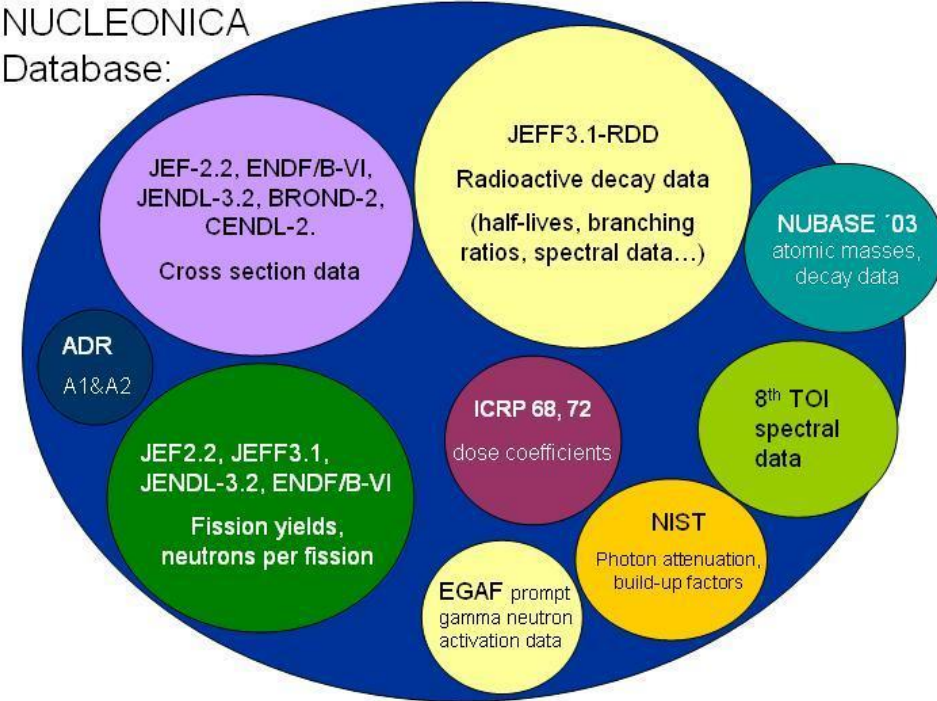
Download ☒ Excel ☐ CSV Separator:  ☒ Use field qualifier (?)

**60**  
**27** **Co**<sub>33</sub> ☒ gamma ☐ beta<sup>-</sup> ☐ discrete e<sup>-</sup> ☐ X-rays & annihilation

Type	Energy(keV) JEFF-3.1	Energy(keV) ENDF/B-VII.1	Emission Probability JEFF-3.1	Emission Probability ENDF/B-VII.1
γ	1332.490 (± 0.004)	1332.492 (± 0.004)	9.998260e-1 (± 6.0e-6)	9.998260e-1 (± 6.0e-6)
γ	1173.230 (± 0.003)	1173.228 (± 0.003)	9.9850e-1 (± 3.0e-4)	9.9850e-1 (± 3.0e-4)
γ	826.100 (± 0.030)	826.100 (± 0.030)	7.60e-5 (± 8.0e-6)	7.60e-5 (± 8.0e-6)

Main Nucleonica database JEFF3.1 contains decay data on 3852 nuclide.

## NUCLEONICA Database:



# Nuclear Data Resources in Nucleonica:

# Nuclide Datasheets++

User friendly access to internationally evaluated nuclear data  
with Nucleonica's Nuclide Datasheets++

Nuclide Datasheets++ is an innovative user-friendly web-based application for displaying nuclear decay data from internationally evaluated data libraries such as JEFF3.1, ENDF/B-VII.1, etc. Through the use of filters, different types of spectral data (gamma, alpha, beta, etc.) from different sources can be compared.

It is aimed at professionals for fast lookup of relevant nuclear data. Nuclide Datasheets++ is particularly suitable for education and training of young scientists, engineers and technicians in the nuclear domain.

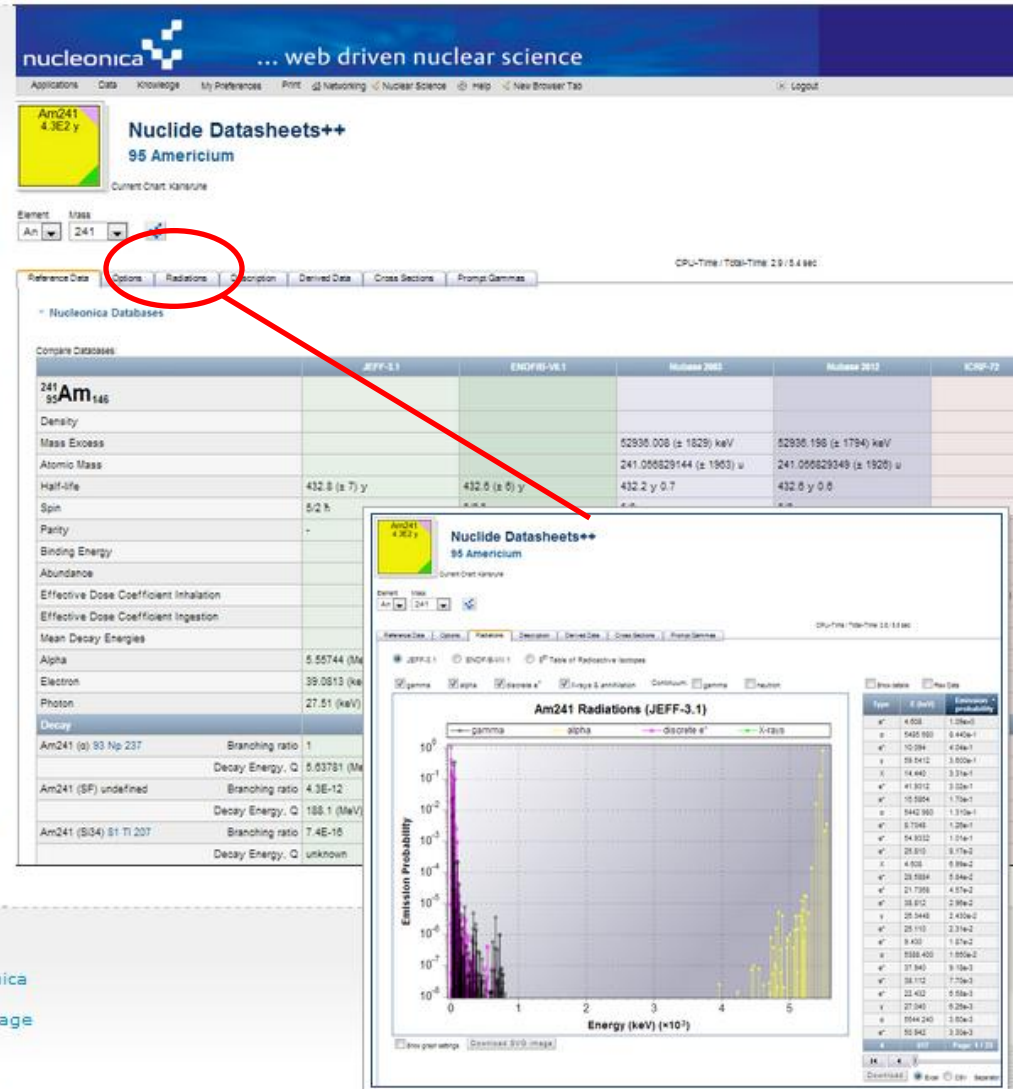
Datasheets++ is ideal for physicists, chemists, and technical experts from the nuclear industry, nuclear research organizations, universities, regulatory authorities and nuclear medicine institutes. It can be used in the fields of radiation protection, health physics, radiochemistry, nuclear waste characterization, decommissioning, nuclear security, nuclear forensics, nuclear medicine, etc.

» Register now for Free access to test the Datasheets++

Further information...

- [More information on Nucleonica](#)
- [Nucleonica brochure](#)
- [Nuclide Datasheets++ wiki page](#)
- [Nucleonica Blog](#)

Contact us at [info@nucleonica.com](mailto:info@nucleonica.com)





# Validated Nuclear Science Applications & Tools

## Decay Engine++



... web driven nuclear science

### Radioactive Decay Calculations with Nucleonica's Decay Engine++

» Nucleonica's Decay Engine++ is an innovative user-friendly web-based application for investigating the radioactive decay of nuclides and nuclide mixtures. It is based on the exact mathematical solution to the Bateman equations.

» It is suitable for professionals for everyday calculations and for testing, validating and verifying complex computer models. The Decay Engine++ is particularly suitable for education and training of young scientists, engineers and technicians in the nuclear domain.

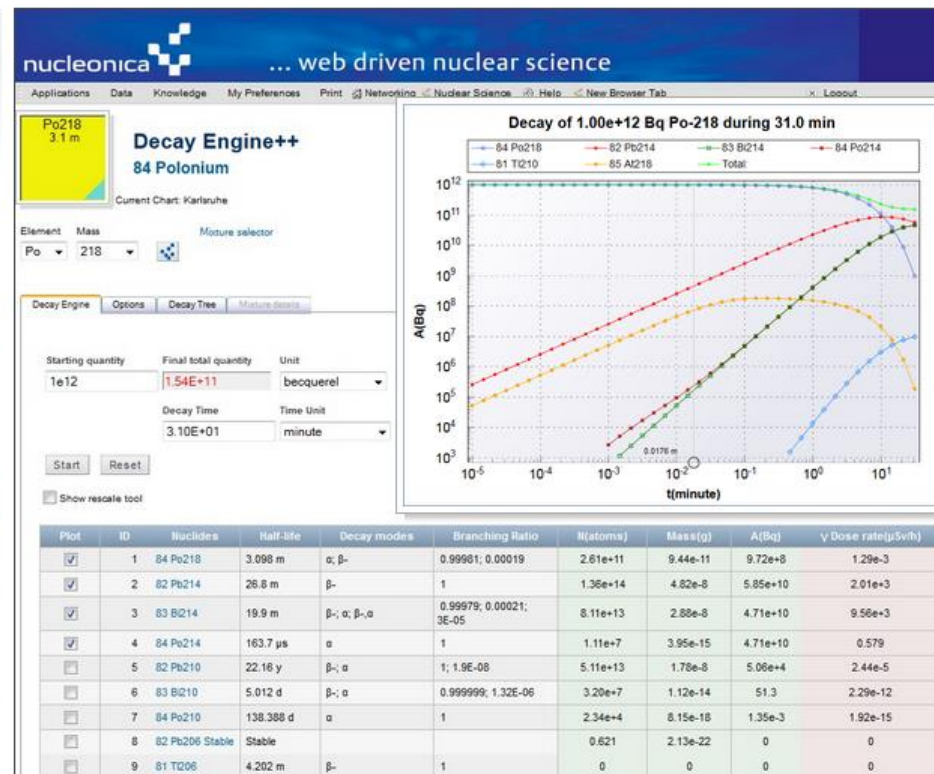
» Decay Engine++ is ideal for physicists, chemists, and technical experts from the nuclear industry, nuclear research organizations, universities, regulatory authorities and nuclear medicine institutes. It can be used in the fields of radiation protection, health physics, radiochemistry, nuclear waste characterization, decommissioning, nuclear security, nuclear forensics, nuclear medicine, etc.

» [Register now for Free access to test the Decay Engine++](#)

Further information...

- [More information on Nucleonica](#)
- [Nucleonica brochure](#)
- [Decay Engine++ wiki page](#)
- [Nucleonica Blog](#)

Contact us at [info@nucleonica.com](mailto:info@nucleonica.com)



# Radiation dosimetry and shielding calculations

## with Nucleonica's Dosimetry & Shielding++

Validated  
Nuclear  
Science  
Applications  
& Tools

Dosimetry  
&  
Shielding++

» Nucleonica's Dosimetry & Shielding++ is an innovative user-friendly web-based application for investigating the gamma dose rates from radioactive nuclides and nuclide mixtures based on the point source kernel method. More than 1300 gamma and X-ray emitting nuclides with 53,000 gamma and X-rays are available in the Nucleonica database, together with data for ten different shield materials and their associated buildup factors.


» It is suitable for professionals for everyday calculations and is suitable for education and training of young scientists, engineers and technicians in the nuclear domain.

» Dosimetry & Shielding++ is ideal for physicists, chemists, and technical experts from the nuclear industry, nuclear research organizations, universities, regulatory authorities and nuclear medicine institutes. It can be used in the fields of radiation protection, health physics, radiochemistry, nuclear waste characterization, decommissioning, nuclear security, nuclear forensics, nuclear medicine, etc.

» Register now for Free access to test the Dosimetry & Shielding++

Further information...

- [More information on Nucleonica](#)
- [Nucleonica brochure](#)


... web driven nuclear science

[Applications](#)
[Data](#)
[Knowledge](#)
[My Preferences](#)
[Print](#)
[Networking](#)
[Nuclear Science](#)
[Help](#)
[New Browser Tab](#)

Co60

10.47 m 5.27 y

### Dosimetry and Shielding

27 Cobalt

Current Chart: Karlsruhe

Element Mass

Co 60

Mixture select

☐ Include daughters

Nuclide	Gamma Energy (keV)	Emission Probability P (per disintegration)	Mass Attenuation Coefficient (shielding)(cm <sup>2</sup> /g)	Number of Mean Free Paths (μd)
27 Co 60	1332.49	1.00E+00	5.64E-02	6.40E-01
27 Co 60	1173.23	9.99E-01	6.20E-02	7.04E-01
27 Co 60	826.1	7.60E-05	8.59E-02	9.75E-01
27 Co 60	2158.57	1.20E-05	4.54E-02	5.15E-01
27 Co 60	347.14	7.50E-05	3.05E-01	3.40E+00
27 Co 60	2505.69	2.00E-08	4.39E-02	4.99E-01
27 Co 60	7.47815	6.44E-05	2.71E+02	3.07E+03
27 Co 60	7.46089	3.27E-05	2.72E+02	3.09E+03
27 Co 60	8.26	1.31E-05	2.11E+02	2.40E+03
27 Co 60	0.85	1.49E-06	7.16E+03	8.12E+04

10 Radiations Page: 1 / 1

Dosimetry and Shielding

Dose rate/Thickness graph Options Mixture details

Initial source strength

Activity(Bq) 1E+06

Shielding material

Pb 1 cm

Dose rate (μSv/h)

2.67E-01



Source

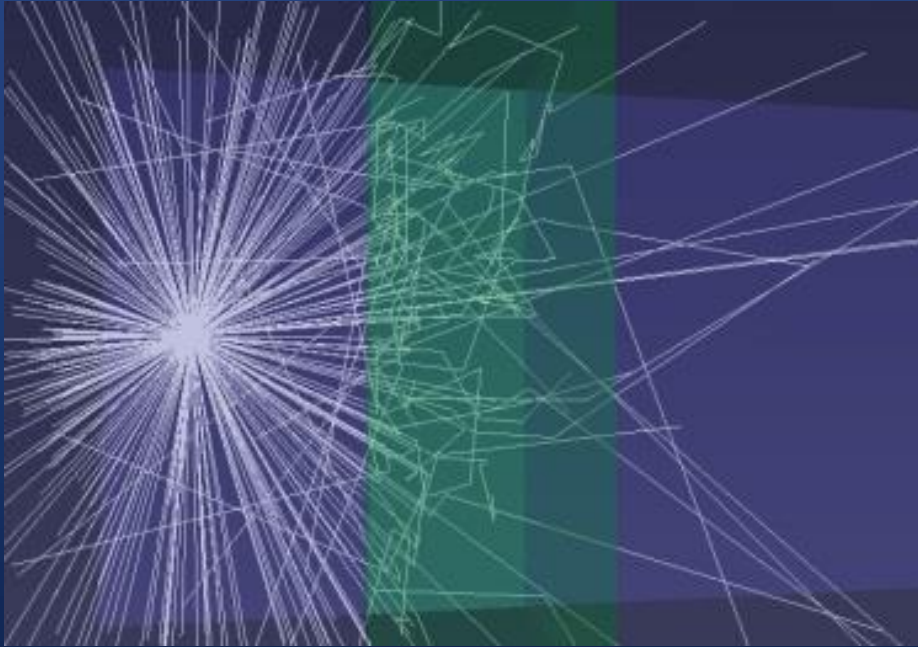
Shield

Detector

Source/detector distance (cm)

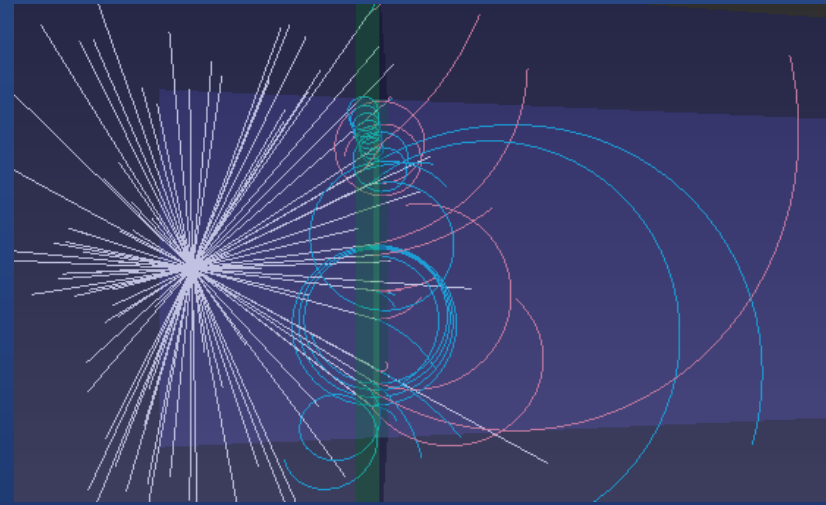
100

## Virtual Cloud Chamber

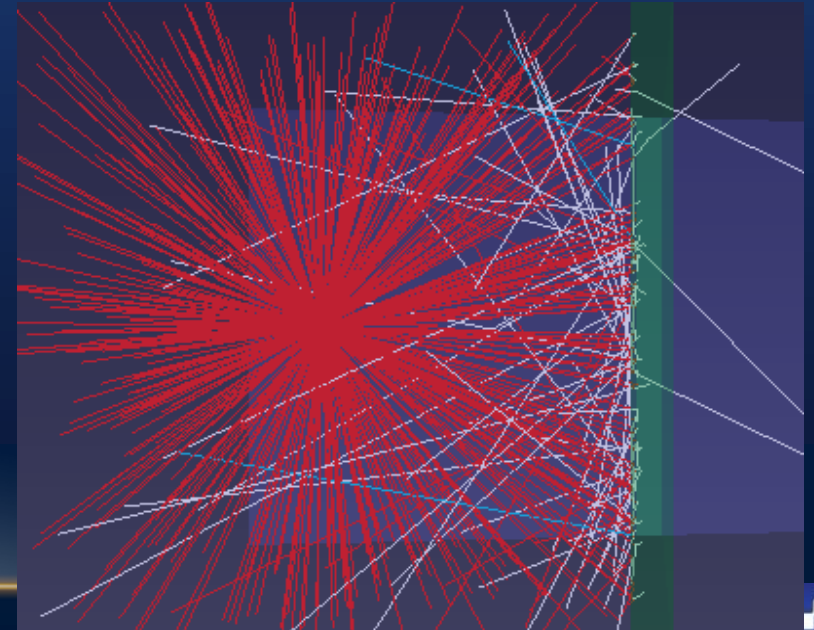


low energy photons (energy 100 keV) are attenuated with a thick (15 cm) water shield. This combination of low energies and thick shields give rise to multiple scattering of the radiation

The red particles (3 MeV positrons) are blocked by a lead shield (green). When the positrons collide with the shield, they combine with electrons (blue) to create gamma radiation (white). Only a few gamma photons pass through the shield material.



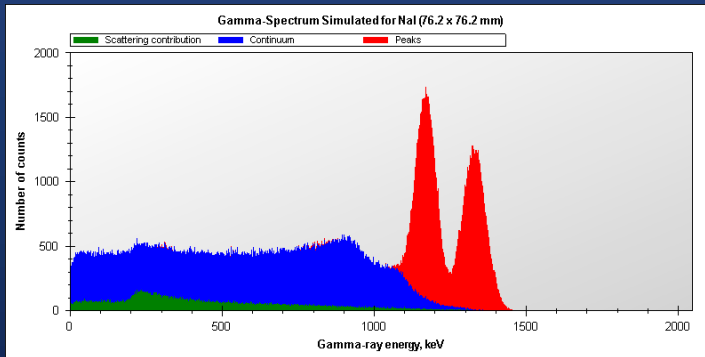
Electron-positron pairs are created using 10 MeV photons on lead. By “switching off” energy loss mechanisms, the charged particles are seen to spiral in the applied magnetic field.



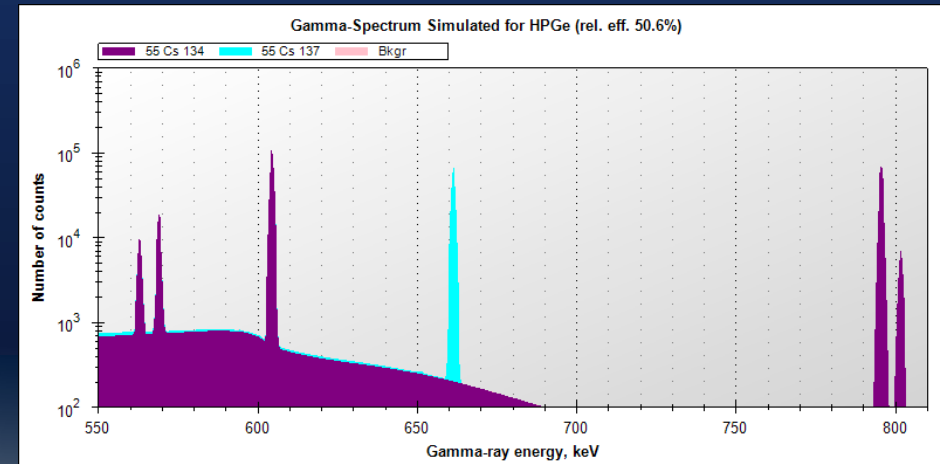
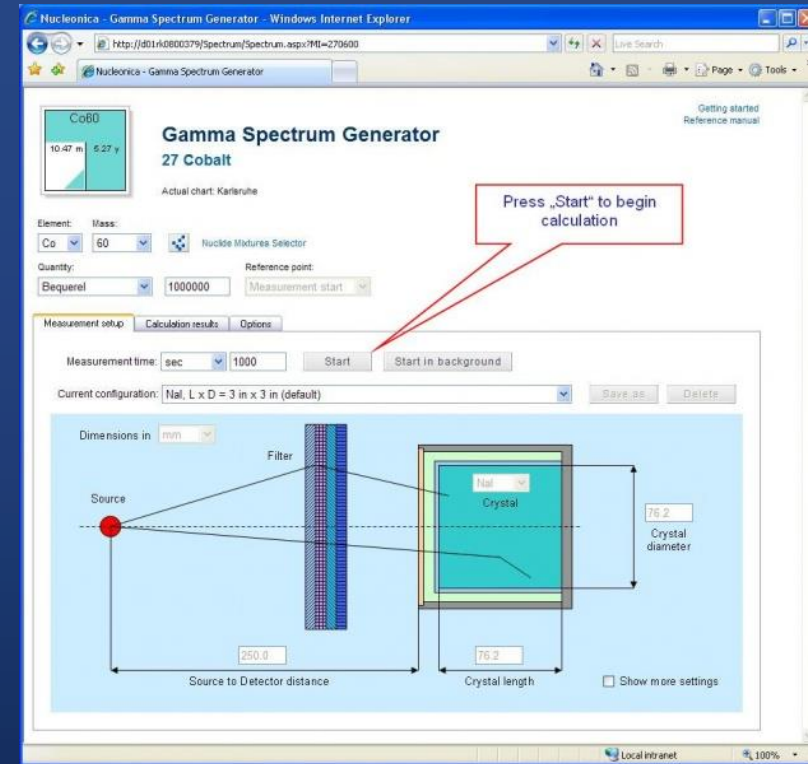
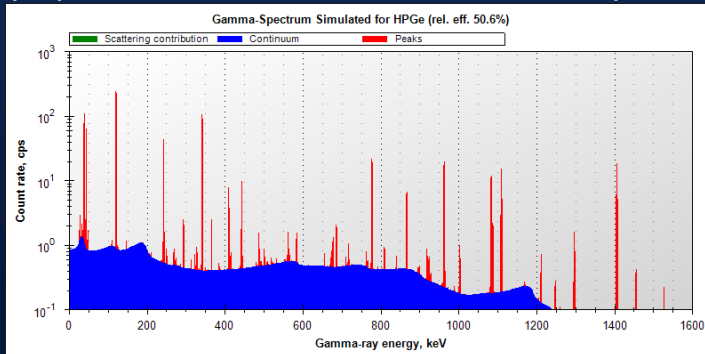


## Gamma Spectrum Generator

$\gamma$ -spectrum simulated for  $^{60}\text{Co}$  100 kBq source and NaI (3"  $\times$  3") detector:



$\gamma$ -spectrum simulated for  $^{152}\text{Eu}$  100 kBq source and HPGe detector.



Fukushima: Gamma spectrum of contamination at the Daiichi plant.  
Contamination is almost entirely to cesium-137 and cesium -134



# Validated Nuclear Science Applications & Tools

## webKORIGEN

fuel depletion calculations  
& neutron activation



... web driven nuclear science

Applications Data Knowledge My Preferences Print Networking Nuclear Science Help New Browser

Version: 2012.08.09 17:55:51



### webKORIGEN

Questions, remarks, suggestions can be posted in the [forum](#)

webKORIGEN was developed from the Oak Ridge Isotope Generation and Depletion code ORIGEN. Starting with a given initial reactor fuel or a single target nuclide, it calculates the time evolution of nuclide densities changing due to decays and neutron-induced reactions, and determines derived nuclear properties such as masses, radioactivities, heat releases, radiotoxicities, emission of radiation, etc...



### webKORIGEN

Questions, remarks, suggestions can be posted in the [forum](#)

webKORIGEN was developed from the Oak Ridge Isotope Generation and Depletion code ORIGEN. Starting with a given initial reactor fuel or a single target nuclide, it calculates the time evolution of nuclide densities changing due to decays and neutron-induced reactions, and determines derived nuclear properties such as masses, radioactivities, heat releases, radiotoxicities, emission of radiation, etc...

Step 1: Calculation Mode

Step 2: Reactor / Operation

Step 3: Input Summary and Run

Step 4: Display Results

Step 5: Log files

Step 6: Parameters

### Display results for nuclides/elements dominant at 6 y decay

Nuclides/Elements Radiations Nuclide Chart

Display quantity: Mass (g)

Filter:

Save as Mixture ...of up to 20 selected Nuclides

Plot	Z	Nuclides	Results	Plot	Z	Elements	Results	Plots	Totals	Nuclides	Elements	Results
<input type="checkbox"/>	55	Cs133	3.416e+4	<input type="checkbox"/>	92	Uranium	1.861e+7	<input checked="" type="checkbox"/>	<b>Actinides+Progenies:</b>	<b>97</b>	<b>19</b>	<b>1.887e+7</b>
<input checked="" type="checkbox"/>	55	Cs137	3.410e+4	<input type="checkbox"/>	94	Plutonium	2.276e+5	<input type="checkbox"/>	Actinides:	61	11	1.887e+7
<input type="checkbox"/>	55	Cs135	1.208e+4	<input type="checkbox"/>	54	Xenon	1.699e+5	<input type="checkbox"/>	Transuranium:	38	7	2.610e+5
<input checked="" type="checkbox"/>	55	Cs134	6.419e+2	<input type="checkbox"/>	60	Neodymium	1.252e+5	<input type="checkbox"/>	Minor Actinides:	21	3	3.341e+4
<input type="checkbox"/>	55	Cs136	5.206e-9	<input type="checkbox"/>	40	Zirconium	1.150e+5	<input type="checkbox"/>	Radon:	3	1	1.417e-9
<input type="checkbox"/>	55	Cs138	4.691e-10	<input type="checkbox"/>	42	Molybdenum	1.084e+5	<input checked="" type="checkbox"/>	<b>Fission Products:</b>	<b>725</b>	<b>44</b>	<b>1.096e+6</b>
<input type="checkbox"/>	55	Cs139	1.107e-10	<input checked="" type="checkbox"/>	55	Cesium	8.098e+4	<input type="checkbox"/>	Lanthanides:	138	12	3.174e+5
<input type="checkbox"/>	55	Cs140	9.061e-12	<input type="checkbox"/>	58	Cerium	7.809e+4	<input type="checkbox"/>	Rare Earths:	180	14	3.445e+5
<input type="checkbox"/>	55	Cs138m	6.910e-12	<input type="checkbox"/>	44	Ruthenium	7.039e+4	<input type="checkbox"/>	Noble Metals:	90	4	1.385e+5
<input type="checkbox"/>	55	Cs141	2.523e-12	<input type="checkbox"/>	56	Barium	5.764e+4	<input type="checkbox"/>	Inert Gases (Ne, Ar, Kr, Xe):	46	2	1.809e+5
<input type="checkbox"/>	55	Cs135m	1.396e-12	<input type="checkbox"/>	46	Palladium	5.336e+4	<input type="checkbox"/>	Hydrogen:	3	1	1.275e+0
<input type="checkbox"/>	55	Cs134m	1.228e-13	<input type="checkbox"/>	57	Lanthanum	3.918e+4	<input type="checkbox"/>	<b>Helium:</b>	<b>1</b>	<b>1</b>	<b>9.335e+1</b>
<input type="checkbox"/>	55	Cs142	5.938e-14	<input type="checkbox"/>	59	Praseodymium	3.635e+4	<input type="checkbox"/>	<b>Total:</b>	<b>823</b>	<b>64</b>	<b>1.997e+7</b>
<input type="checkbox"/>	55	Cs143	1.592e-14	<input type="checkbox"/>	62	Samarium	2.612e+4					
<input type="checkbox"/>	55	Cs144	1.650e-15	<input type="checkbox"/>	43	Technetium	2.462e+4					
<input type="checkbox"/>	55	Cs145	6.462e-17	<input type="checkbox"/>	38	Strontium	2.433e+4					
<input type="checkbox"/>	55	Cs146	2.443e-18	<input type="checkbox"/>	93	Neptunium	1.574e+4					
<input type="checkbox"/>	55	Cs147	6.569e-20	<input type="checkbox"/>	95	Americium	1.534e+4					
<input type="checkbox"/>	55	Cs148	9.250e-22	<input type="checkbox"/>	39	Yttrium	1.397e+4					

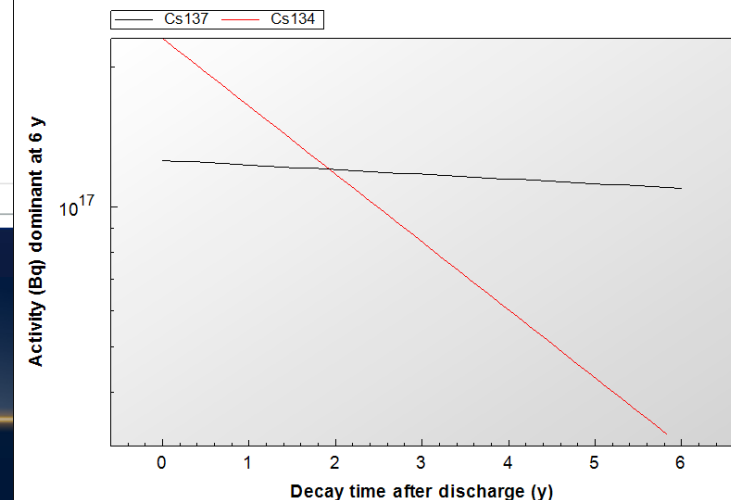
Reactor irradiation

Decay

Power  
Flux

Reactor irradiation and decay

### Nuclides during 6 y decay of 20 tHM PWR UOX 55 MWd/kg



Validated Nuclear Science Applications & Tools

e-Ship:  
package classification for radioactive transports

e-Ship: nuclear material transport report

Transport report generated for source: Irradiated sample (iron) by iss1 iss1 on Aug 21, 2013 11:24:31  
DISCLAIMER: This tool is a help to choose the package classification, please always refer to the country specific regulations

Package name: Irradiated sample (iron)  
Description: Package created from CERN spectrum file. The activity was reported on 27.2.2012.

Package characterisation: Material, Other form, Solid  
Host material mass: 1 g  
Activity reported: Feb 27, 2012 08:00:00

Please take care of subsidiary risk.  
Chemical form:  
For the definition of the quantities used in this report see the Nucleonica Glossary

Source characterisation

Data extracted from Swiss RPO, Appendix 3, pages 65... from 1 January 2013.

Nuclide	Half-life	Activity (Bq)	Heat (W)	Ambient dose rate H <sub>10</sub> (µSv/h) at 10 cm	E <sub>ing</sub> (mSv)	E <sub>inh</sub> (mSv)	A(Bq) LE(Bq)	A(Bq/kg) LE(Bq/kg)	A(Bq) LA(Bq)	Radioactive contents	Notes
Be-7	53.22 d	3.11e+4	2.48e-10	2.49e-2	8.71e-4	1.71e-3	7.78e-2	7.78e+1	3.11e-4	(Bq)	
Co-58	77.31 d	1.88e+2	1.11e-10	9.02e-3	4.85e-4	1.25e-3	4.85e-2	4.85e+1	1.88e-4	(Bq)	
Co-57	271.80 d	1.02e+3	2.34e-11	2.14e-3	2.14e-4	1.02e-3	2.04e-2	2.04e+1	1.28e-4	(Bq)	
Co-58	70.86 d	7.22e+2	1.17e-10	1.05e-2	5.34e-4	1.52e-3	7.22e-2	7.22e+1	2.41e-4	(Bq)	
Co-60	5.271 y	1.19e+2	4.95e-11	4.38e-3	4.05e-4	3.05e-3	1.19e-1	1.19e+2	1.32e-3	(Bq)	
Mn-54	312.13 d	7.88e+2	1.05e-10	9.90e-3	5.58e-4	1.18e-3	7.88e-2	7.88e+1	1.97e-4	(Bq)	
Na-22	2.6027 y	5.25e+4	2.00e-8	1.73e+0	1.85e-1	6.83e-2	1.75e+1	1.75e+4	1.75e-2	(Bq)	
Sc-46	83.79 d	2.24e+2	7.80e-11	6.70e-3	3.36e-4	1.52e-3	3.20e-2	3.20e+1	2.24e-4	(Bq)	
Ta-182	114.7 d	3.23e+2	7.75e-11	6.27e-3	4.85e-4	3.23e-3	4.61e-2	4.61e+1	4.61e-4	(Bq)	
Y-88	106.63 d	1.45e+2	6.27e-11	5.51e-3	1.89e-4	6.38e-4	1.81e-2	1.81e+1	7.25e-5	(Bq)	
Total: 10		8.71e+4	2.09e-8	1.81e+0	1.72e-1	8.40e-2	1.80e+1	1.80e+4	2.06e-2		

Package characterisation

Data extracted from ADR Table of A<sub>1</sub>, A<sub>2</sub> values, exemption limits and notes (pages 218...)

Nuclide	Activity (Bq)	A <sub>2</sub> (TBq)	Exempt (Bq)	Exempt (Bq/g)	Exempt (GBq)	A <sub>1</sub> (Bq)	A <sub>2</sub> (TBq)	A <sub>1</sub> (Bq/g)	A <sub>2</sub> (TBq/g)
Be-7	3.11e+4	2.00e+1	1.00e+7	1.00e+3	2.00e+1	1.55e-9	3.11e-3	3.11e+1	1.55e-8
Co-58	1.88e+2	3.00e-1	1.00e+5	1.00e+1	3.00e-1	6.20e-10	1.88e-3	1.88e+1	6.20e-7
Co-57	1.02e+3	1.00e+1	1.00e+8	1.00e+2	1.00e+1	1.02e-10	1.02e-3	1.02e+1	1.02e-7
Co-58	7.22e+2	1.00e+0	1.00e+6	1.00e+1	1.00e+0	7.22e-10	7.22e-4	7.22e+1	7.22e-7
Co-60	1.19e+2	4.00e-1	1.00e+5	1.00e+1	4.00e-1	2.98e-10	1.19e-3	1.19e+1	2.98e-7
Mn-54	7.88e+2	1.00e+0	1.00e+6	1.00e+1	1.00e+0	7.88e-10	7.88e-4	7.88e+1	7.88e-7
Na-22	5.25e+4	5.00e-1	1.00e+8	1.00e+1	5.00e-1	1.05e-7	5.25e-2	5.25e+3	1.05e-4
Sc-46	2.24e+2	5.00e-1	1.00e+6	1.00e+1	5.00e-1	4.48e-10	2.24e-4	2.24e+1	4.48e-7
Ta-182	3.23e+2	5.00e-1	1.00e+4	1.00e+1	5.00e-1	6.46e-10	3.23e-2	3.23e+1	6.46e-7
Y-88	1.45e+2	4.00e-1	1.00e+6	1.00e+1	4.00e-1	3.83e-10	1.45e-4	1.45e+1	3.83e-7
Total: 10	8.71e+4					1.11e-7	9.39e-2	5.54e+3	1.11e-4

Package Exempt from regulation

nucleonica... web driven nuclear science

ApplicationsDataKnowledgeMy PreferencesPrintNetworkingNuclear ScienceHelpNew Browser TabLogout

### e-Ship++

radiological transport assistant

This is a beta version of the new web application e-Ship++. Please report errors to info@nucleonica.com.

DISCLAIMER: This tool is a help to choose the package classification, please always refer to the country specific regulations.

My PackagesEditOptionsDecayImportActivity limitsSwiss RPOSample packagesAbout e-Ship

User defined transport packages

Package Name	Mass (g)	Items	Content	Form	State	Activity reported	last modified	Download	Delete
(Create, import a new package)									
1g irradiated UOX fuel	1		Material	Other	Solid	2013.08.01 08:12:23	2013.08.01 08:12:23		
ISOLDE Target	25000		Material	Other	Solid	2013.04.14 17:28:38	2013.04.15 09:14:00		
Decayed: Sr83	1		Material	Other	Solid	2013.04.11 16:50:25	2013.04.11 16:53:37		
Spectro	1		Material	Other	Solid	2012.01.06 08:00:00	2012.08.22 13:11:36		
Irradiated sample using 26 GeV protons	1		Material	Other	Solid	2012.05.24 08:00:00	2012.08.22 12:35:15		
Irradiated sample (iron)	1		Material	Other	Solid	2012.02.27 08:00:00	2012.08.22 11:46:31		
Simple Package (Exempted)	1		Material	Other	Solid	2012.08.10 08:00:00	2012.08.22 11:23:31		
My 1st Package (Type A)	5		Material	Other	Solid	2012.08.03 08:00:00	2012.08.22 11:15:18		
My 1st Package (Exempted)	10		Material	Other	Solid	2012.08.02 08:00:00	2012.08.22 11:13:16		
My 1st Package (Exempted)	150		Material	Other	Solid	2012.08.01 08:00:00	2012.08.22 11:02:28		
Total: 10									

This is a beta version of the new web application e-Ship++. Please report errors to info@nucleonica.com.

DISCLAIMER: This tool is a help to choose the package classification, please always refer to the country specific regulations.

My PackagesEditOptionsDecayImportActivity limitsSwiss RPOSample packagesAbout e-Ship

Name (ID=1203)

Irradiated sample (iron)

Chemical form (please take care of subsidiary risk):

Description:

Package created from CERN spectrum file. The activity was reported on 27.2.2012.

Activity reported: 2012.02.27 08:00:00

Package characteristics

Content

- Material
- Instruments / Articles

Form

- Other
- Special

State

- Solid
- Liquid
- Gas

Host material: 1 g

Nuclide	Activity A (Bq)	Mass (g)	Half-life	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Exempted (GBq)	Exempt (Bq)	Exempt (Bq/g)	A <sub>1</sub> (Bq/g)	A <sub>2</sub> (Bq/g)	Exempted (Bq/g)	A (Bq/g)	Exempt (Bq/g)
Be-7	3.11e+4	2.40e-12	53.22 d	20	20	20.0	1.00e+07	1.00e+03	1.55e-9	1.55e-6	3.11e-3	31.1	31.1
Co-56	186	1.66e-13	77.31 d	0.3	0.3	0.300	1.00e+05	1.00e+01	6.20e-10	6.20e-7	1.86e-3	18.6	18.6
Co-57	1.02e+3	3.27e-12	271.80 d	10	10	10.0	1.00e+06	1.00e+02	1.02e-10	1.02e-7	1.02e-3	10.2	10.2
Co-58	722	6.14e-13	70.86 d	1	1	1.00	1.00e+06	1.00e+01	7.22e-10	7.22e-7	7.22e-4	72.2	72.2
Co-60	119	2.84e-12	5.271 y	0.4	0.4	0.400	1.00e+05	1.00e+01	2.98e-10	2.98e-7	1.19e-3	11.9	11.9
Mn-54	786	2.74e-12	312.13 d	1	1	1.00	1.00e+06	1.00e+01	7.86e-10	7.86e-7	7.86e-4	78.6	78.6
Na-22	5.25e+4	2.27e-10	2.6027 y	0.5	0.5	0.500	1.00e+06	1.00e+01	1.05e-7	1.05e-4	5.25e-2	5.25e+3	5.25e+3
Sc-46	224	1.79e-13	83.79 d	0.5	0.5	0.500	1.00e+06	1.00e+01	4.48e-10	4.48e-7	2.24e-4	22.4	22.4
Ta-182	323	1.40e-12	114.7 d	0.9	0.5	0.500	1.00e+04	1.00e+01	6.46e-10	6.46e-7	3.23e-2	32.3	32.3
Y-88	145	2.81e-13	106.63 d	0.4	0.4	0.400	1.00e+06	1.00e+01	3.82e-10	3.82e-7	1.45e-4	14.5	14.5
Total: 10	8.712e+4	2.409e-10							1.11e-7	1.11e-4	9.39e-2	5.54e+3	5.54e+3

ElementMassPropertyQuantityUnit

Y88145Becquerel

Update

Save PackageResetCancelReport

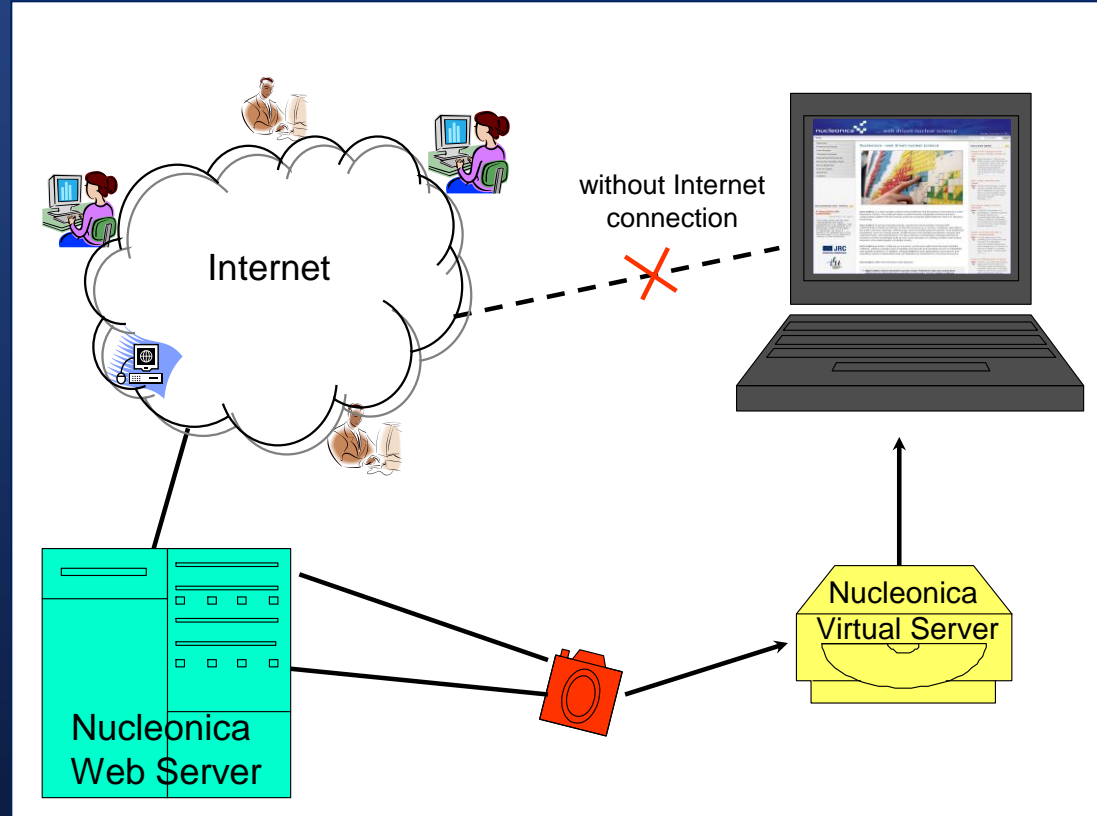
nucleonica

# Nucleonica for Smartphones: and Tablet PCs: M-Learning



# Standalone version of Nucleonica

- specially developed for mobile labs and field workers or for use on Notebooks/PCs where an internet connection cannot be guaranteed
- faster than internet version
- allows for more particles in Monte Carlo calculations than the internet version
- allows Monte Carlo dosimetry and shielding calculations (provided you have an MCNP license!)



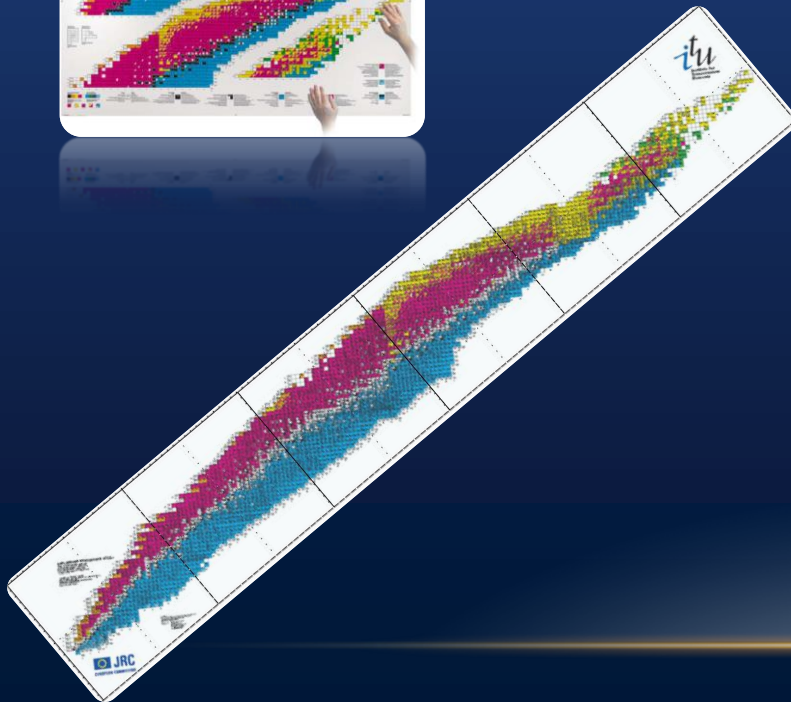


# Education & Training with Nucleonica

## Karlsruhe Nuclide Chart



- Fold-out Chart
- Wall-Chart
- Auditorium Chart
- Nuclide Carpet

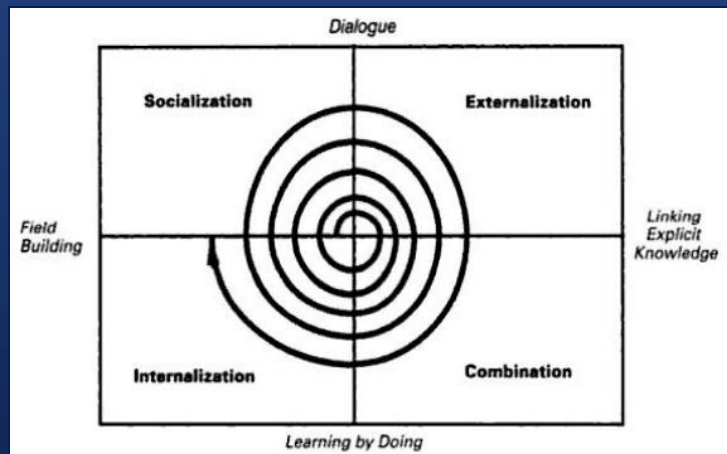


Nuclide „carpet“  
1m x 6.5m

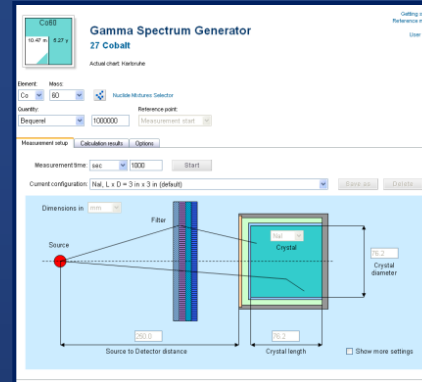


# Knowledge Management with Nucleonica

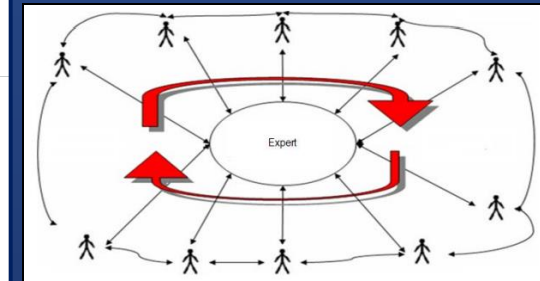
In this slide, the Nucleonica web portal is considered from a knowledge management perspective. Nonaka and Takeuchi have proposed the “knowledge spiral” (shown) in which there are four modes of knowledge conversion: socialization, externalization, combination and internalization (SECI model).



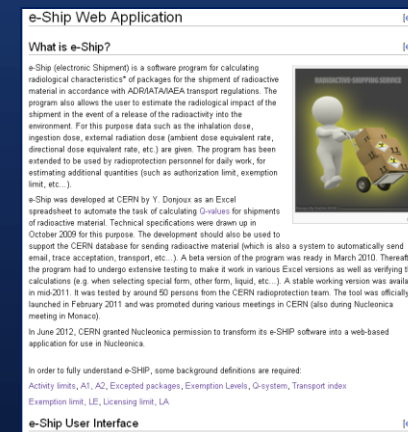
**Socialisation:** conversion of tacit knowledge to tacit knowledge e.g. an apprentice who works with tutor and learns from observing and imitating the tutor's actions. **Externalization:** conversion of tacit to explicit knowledge. **Combination** is the conversion of explicit to explicit knowledge. The process of systemizing already explicit knowledge into a knowledge system. **Internalization** is the conversion from explicit to tacit, which is closely related to “learning by doing”. At the end of the spiral process, one or more individuals in the organisation have acquired new tacit knowledge.



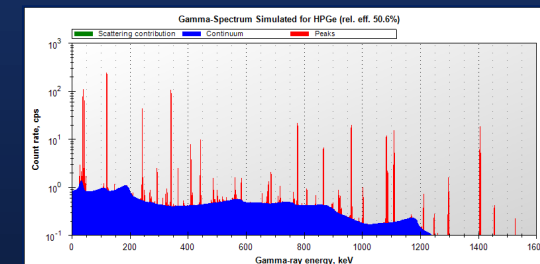
**Socialisation:** conversion of tacit knowledge to tacit knowledge



**Externalization:** conversion of tacit to explicit knowledge



**Combination:** systemizing explicit knowledge

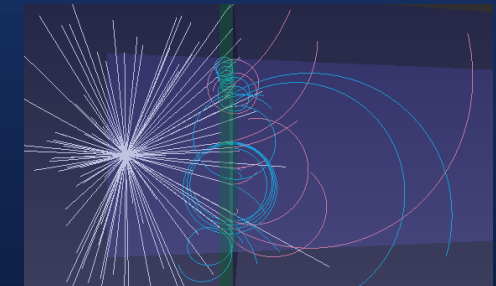
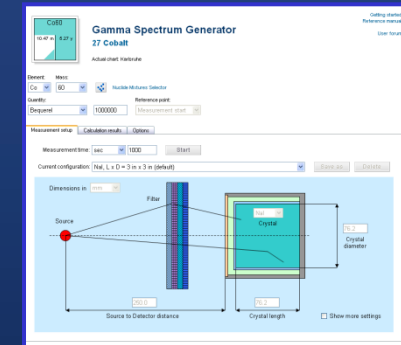
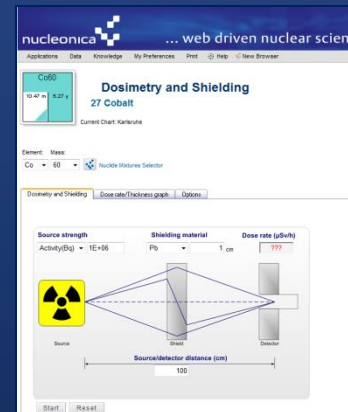


**Internalization:** conversion from explicit to tacit, triggered through “Learning by Doing”.

# Nucleonica: Web-based Software Tools for Simulation and Analysis



- Nuclear Data Resources in Nucleonica
- Nuclear Science Applications & Tools
  - Decay Engine
  - Dosimetry & Shielding
  - Virtual Cloud Chamber
  - Gamma Spectrum Generator
  - webKORIGEN
  - e-Ship
- Education & Training with Nucleonica
  - Nucleonica Mobile
  - Karlsruhe Nuclide Chart
- Knowledge Management with Nucleonica



# The Nucleonica Wiki...

	<a href="#">page</a>	<a href="#">discussion</a>	<a href="#">view source</a>	<a href="#">history</a>	<a href="#">delete</a>	<a href="#">unwatch</a>
--	----------------------	----------------------------	-----------------------------	-------------------------	------------------------	-------------------------

# Main Page

---

## Welcome to the Nucleonica Wiki!

The Nucleonica wiki is an open knowledge resource for the nuclear sciences. In contrast to Wikipedia, which can be edited by anyone, the Nucleonica wiki articles are written by experts and practitioners in the field and cannot be edited. The Nucleonica wiki is devoted specifically to nuclear science. Wiki technology is best suited for this purpose since it allows addition of content at any time from any location.

Another aim the Nucleonica wiki is to provide the technical documentation in support of the Nucleonica nuclear science portal [www.nucleonica.com](http://www.nucleonica.com). Whereas the Nucleonica portal requires registration to access its applications and data pages, the wiki is an "open" knowledge resource.

---

## How this Wiki is organized

The Sidebar panel to the left of this window provides quick links to a number of important pages in this wiki. The links are grouped under:

- navigation
- support
- tools
- search
- toolbox

The Wiki contains a collection of articles. Each article has a title (by which it is referenced) and optionally one or more categories. Under [Special / Categories](#) you can see all currently existing categories. Thus, it is possible to navigate through all documents by the category and subcategory tree feature of the Wiki.

Of special importance is the [Help](#) link. This page contains a collection of articles and is used specifically to support the Nucleonica applications and nuclear data pages. For users logged into the Nucleonica Portal, the context sensitive Help in Nucleonica will lead the user to the corresponding page in the wiki.

Another important item is the Search box. By entering a character string here, the entire wiki is searched. The search results are structured in a coherent way. Enter a piece of text into the Search box (e.g. Curie) and try out this powerful search tool!

[What is Nucleonica?](#)

New! Nucleonica Newsletter

**navigation**

- Main Page
- Help
- Glossary
- Element Information
- ReadingRoom
- Gallery of Nuclear Science
- Weblinks
- Karlsruhe Nuclide Chart
- Premium Membership

**support**

- Training Courses
- Case Studies
- Nucleonica Support

**tools**

- Recent changes
- Random page

**search**

**toolbox**

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

[category](#)
[discussion](#)
[edit](#)
[history](#)
[delete](#)
[watch](#)

# nucleonica [wiki]

navigation

- Help
- Glossary
- Element Information
- ReadingRoom
- Gallery of Nuclear Science
- Weblinks
- Karlsruhe Nuclide Chart
- Premium Membership

support

---

## Category:Glossary

This Glossary is based mainly on the following sources:

- J. Magill and J. Galy, [Radioactivity Radionuclides Radiation](#) Springer Verlag, 2005
- J. Magill, G. Pfennig, J. Galy, [Karlsruhe Nuclide Chart](#), 7th Edition, 2006.
- Additional information can be found in the IAEA [Safety Glossary](#), Terminology Used in Nuclear Safety and Radiation Protection 2007 Edition.
- See also the CTBTO glossary <http://www.ctbto.org/glossary/>

### Articles in category "Glossary"

There are 179 articles in this category.

<b>E cont.</b>	<b>O</b>
<ul style="list-style-type: none"> <li>Exemption Levels</li> </ul>	<ul style="list-style-type: none"> <li>Orphan source</li> </ul>
<b>F</b>	<b>P</b>
<ul style="list-style-type: none"> <li>Fermion</li> <li>Find</li> <li>Fissile</li> <li>Fission</li> <li>Fundamental forces</li> </ul>	<ul style="list-style-type: none"> <li>Pair production</li> <li>Parity</li> <li>Particle Theory</li> <li>Photon</li> <li>Physical protection</li> <li>Polonium 210</li> <li>Positron</li> <li>Primordial radionuclides</li> <li>Proton</li> </ul>
<b>G</b>	<b>Q</b>
<ul style="list-style-type: none"> <li>Gamma radiation</li> <li>Geological repository</li> <li>Glioblastoma</li> <li>Gram atom</li> <li>Gray, (Gy)</li> </ul>	<ul style="list-style-type: none"> <li>Quality factor</li> </ul>
<b>H</b>	<b>R</b>
<ul style="list-style-type: none"> <li>HASS Directive</li> <li>Hadron</li> <li>Hadron Therapy</li> </ul>	<ul style="list-style-type: none"> <li>RCM</li> <li>RDD</li> <li>RDF</li> </ul>

ed Dose  
(s)  
  
Exposure  
decay  
particle  
Limit of Intake (ALI)  
ter  
  
Weight  
mass  
number  
effect  
  
(Boron Neutron Capture Therapy)

[help](#) | 
 [discussion](#) | 
 [edit](#) | 
 [history](#) | 
 [delete](#) | 
 [move](#) | 
 [watch](#)

## Help:Radioactive Engine

---

Create [html](#) file for this document

**Contents** [\[hide\]](#)

- 1 Overview**
  - [1.1 Simple Radioactive Decay](#)
  - [1.2 Radioactive Decay Chains](#)
  - [1.3 Convergent and Divergent Branches](#)
  - [1.4 Radioactive Equilibrium](#)
    - [1.4.1 \( \$t\_1 \gg t\_2\$ \): Secular Equilibrium:](#)
    - [1.4.2 \( \$t\_1 > t\_2\$ \): Transient Equilibrium](#)
    - [1.4.3 \( \$t\_1 \approx t\_2\$ \): The Half-life of the Parent is Shorter than that of the Daughter](#)
    - [1.4.4 \( \$t\_1 \approx t\_2\$ \): The Half-lives of the Parent and Daughter are Similar](#)
- 2 Using the Decay Engine Module**
  - [2.1 User Interface](#)
  - [2.2 Options](#)
  - [2.3 Graph](#)
  - [2.4 Details](#)
- 3 References**

## Overview

### Simple Radioactive Decay

Radioactive decay is a random process. It is not possible to predict when a particular can, however, evaluate the probability that a nucleus will decay in a time interval. This decay, first identified by Rutherford, is

$$\frac{dQ}{dt} = -kQ$$

**nucleonica**  
[wiki]

Navigation

- Help
- Glossary
- Element Information
- ReadingRoom
- Gallery of Nuclear Science
- Weblinks
- Karlsruhe Nucleide
- Premium Membership

support

- Training Courses
- Nucleonica at a glance
- Nucleonica Overview
- Ask an Expert
- FAQs
- Technical Support

tools

- Recent changes
- Random page
- Editing

search

Go Search

toolbox

- What links here
- Related changes
- Upload file

readingroom | discussion | edit


# ReadingRoom:Gallery

Contents


- 1 Actinide Science
- 2 Nuclear Science Historical
- 3 Nuclear Science in Karlsruhe...
- 4 Karlsruhe Nucleide Chart, 7th Edition, 2008
- 5 Radioactivity, Radionuclides, Radiations...

## Actinide Science


from the Ins




Sample of refined americium metal, condensed on a tantalum disc (Spiert, 1991), copyright IEC-JRC-ITU




Curium metal produced by the Actinide Group, Institute for Transuranium Elements





Proactinide: Courtesy of the Actinide Group




Uranium metal cube, Institute for Transuranium Elements









search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

The Wiki contains information on [Special /](#) category and subcategory.

Of special importance are the applications and the user to the correct use.

Another important aspect is the structured in a clear and concise way.

[What is Nucleonica](#)

[New! Nucleonica](#)



## Start of the Name Approval Process for the Elements of Atomic Number 114 and 116

February 19th, 2012

by Joseph Magill

A joint IUPAC/IUPAP Working Party (JWP) has confirmed the discovery of the elements with atomic numbers 114 and 116. In accord with IUPAC procedures, the discoverers proposed names as follows: flerovium and symbol, Fl, for the element with  $Z = 114$  and livermorium with the symbol Lv for the element with  $Z = 116$ . The Inorganic Chemistry Division recommended these proposals for acceptance.

Comments should be submitted by 30 April 2012. The text of the Provisional Recommendation can be downloaded from


[http://media.iupac.org/reports/provisional/abstract11/corish\\_300412.html](http://media.iupac.org/reports/provisional/abstract11/corish_300412.html).

Comments should be sent to Prof. John Corish at [jcorish@tcd.ie](mailto:jcorish@tcd.ie).

116				Lv	Lv 290 7.1 ms $\alpha$ 10.84	Lv 291 18 ms $\alpha$ 10.74	Lv 292 18 ms $\alpha$ 10.66	Lv 293 53 ms $\alpha$ 10.63
115		Uup	Uup 287 32 ms $\alpha$ 10.69	Uup 288 87 ms $\alpha$ 10.46	Uup 289 0.22 s $\alpha$ 10.31	Uup 290 ~16 ms $\alpha$ 9.96	176	
114	Fl	Fl 285 ~125 ms $\alpha$	Fl 286 0.13 s $\beta^-$ $\alpha$ 10.19	Fl 287 0.48 s $\alpha$ 10.02	Fl 288 0.69 s $\alpha$ 9.96	Fl 289 2.1 s $\alpha$ 9.87		

Extract from the new 8th Edition (2012) of the Karlsruhe Nuclide Chart showing the isotopes of flerovium and livermorium.

# The Nucleonica Forum...



☐ Remember Me?

[Help](#)
[Register](#)

Advanced Search











[Forum](#)
[Nucleonica Portal](#)
[General](#)


If this is your first visit, be sure to check out the [FAQ](#) by clicking the link above. You may have to [register](#) before you can post: click the register link above to proceed. To start viewing messages, select the forum that you want to visit from the selection below.

Threads 1 to 20 of 105
 

Page 1 of 6
 [1](#)
[2](#)
[3](#)
 ...
 [Last](#)

**Forum: General**  
 General comments

Title / Thread Starter	Replies / Views	Last Post By
 <a href="#">Emergency preparedness analysis for decision-making</a> Jeremie Muswema	Replies: 0 Views: 21	Jeremie Muswema 13-04-12 13:02
 <a href="#">Core Inventory calculations</a> Jeremie Muswema	Replies: 1 Views: 20	HotCells 12-04-12 18:34
 <a href="#">Functionality of the "Gamma Library"</a> Niko	Replies: 4 Views: 80	Jeremie Muswema 12-04-12 17:52
 <a href="#">Being notified for a new thread in the forum</a> SpectrO	Replies: 4 Views: 314	SpectrO 15-03-12 10:59
 <a href="#">Reference book or paper about cross section for neutron induced reactions</a> Giancarlo D'Agostino	Replies: 1 Views: 227	jmagill 09-02-12 07:44
 <a href="#">Free users and WESPA</a> jivko	Replies: 1 Views: 243	jmagill 30-01-12 14:49
 <a href="#">NuTRoNS-2 Monte Carlo, Monaco</a> jmagill <div> <a href="#">1</a> <a href="#">2</a> </div>	Replies: 10 Views: 2,047	zeynepyarar 17-11-11 22:09
 <a href="#">Fission products from spontaneous fission</a> FAQ	Replies: 1 Views: 246	FAQ 09-11-11 07:17
 <a href="#">webKORIGEN output in EXCEL format</a> XRay	Replies: 1 Views: 599	HotCells 26-09-11 18:26
 <a href="#">Why does HEU produce fewer counts than pure U235 in the Gamma Spectrum Generator?</a> XRay	Replies: 1 Views: 464	HotCells 22-09-11 12:02



navigation

- Main Page
- Help
- Glossary
- Element Information
- ReadingRoom
- Gallery of Nuclear Science
- Weblinks
- Karlsruhe Nucleide Chart
- Premium Membership

support

- Training Courses
- Case Studies
- Nucleonica Support

tools

- Recent changes
- Random page

search

Go Search

toolbox

- What links here
- Related changes
- Special pages
- Printable version

category | discussion | view source | history


# Category:Glossary.Packaging

All Glossary articles related to Transport & Packaging

General References:

IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection

ADR 2013: Volume I: Agreement and Protocol of Signature, Annex A: Parts 1 and 2

Swiss Radiological Protection Ordinance (RPO) 

Nucleonica's e-Ship++

## Pages in category "Glossary.Packaging"

The following 60 pages are in this category, out of 60 total.

A

- A1, A2
- Absorbed Dose
- Activated material
- Activity limits
- ADR
- ALI
- Ambient dose equivalent H\*(10)
- Annual Limit of Intake
- Annual Limit of Intake (ALI)

C

- ReadingRoom:Clearance
- Committed effective dose, E
- Committed equivalent dose, H
- Consignment
- Consignor
- Contaminated material
- Contamination

D cont.

- Dose
- Dose coefficient

E

- E-Ship++
- Effective dose
- Effective dose, E
- Enriched uranium
- Equivalent dose
- Excepted packages
- Exempted
- Exemption Level
- Exemption limit

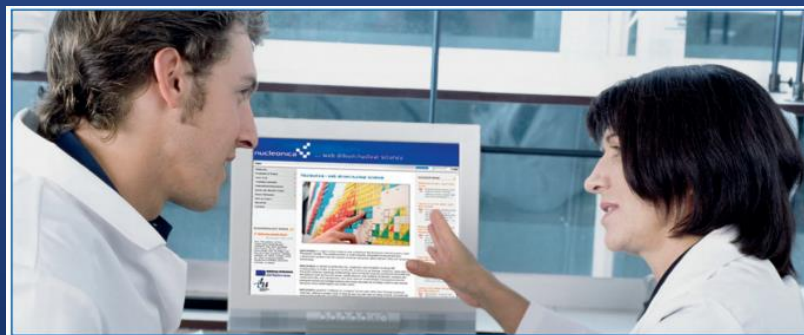
G

- Guidance value

H

nucleonica 

Training  
courses...





# Course Folders...



Introduction to Nucleonica: Core Applications and Tools		
Training course with "Hands on" exercises. To be held at the ORAM JRC desk		
<b>13 June – Core Nucleonica Applications</b>		<b>Index</b>
9:00	Training Course / Nucleonica Overview J. Magill (Nucleonica)	1
9:20	Mass Activity Converter J. Magill	Exercises 2
9:50	Nuclide Mixtures R. Dreher (Nucleonica)	Exercises 3
10:30 – Coffee 10:50	Nuclear Data: from the Karlsruhe Nuclide Chart to Nucleonica Z. Soti (ITU)	Exercises 4
12:30 – Break 13:30	Decay Engine: Decay calculations for single nuclides and mixtures J. Magill	Exercises 5
15:00 – Coffee 15:20	Wiki, Forum, Blog, Glossary: Knowledge Objects Z. Soti	Exercises 6
16:30	Virtual Cloud Chamber: Interaction of particles and photons with matter J. Magill	Exercises 7
17:00 – End of session		
<b>14 June – Core Nucleonica Applications cont'd</b>		
9:00	Gamma Dosimetry & Shielding (D&S) J. Magill	Exercises 8
10:30 – Coffee 10:50	Working with Reference Materials in Nucleonica Z. Soti	Exercises 9
12:30	Feedback/Questionnaire, Certificate	
13:00 – End of Training Course		
Supplementary material:		
Gamma Spectrum Generator + Gamma Libraries		10
webKORGEN		11
e-Ship: Radiological Transport Assistant		12
(Nucleonica Tips & Tricks, additional exercises)		

## Nucleonica: Basic, Core and Advanced Applications

Training course with "Hands on" exercises, *To be held at the IRMM JRC Geel, Belgium*

### 3 Oct. – Basic & Core Nucleonica Applications

			Index
9:00	<b>Training Course / Nucleonica Overview</b> J. Magill (Nucleonica)		1
9:30	<b>Mass Activity Converter</b> J. Magill	Exercises	2a
10:00	<b>Nuclide Mixtures</b> R. Dreher	Exercises	2b
10:30 – Coffee			
10:50	<b>Participants introduction</b>		
11:15	<b>Nuclear Data:</b> from the Karlsruhe Nuclide Chart to Nucleonica, Z. Soti (ITU)	Exercises	3
12:30 – Break			
13:30	<b>Decay Engine</b> J. Magill	Exercises	4
15:00 – Coffee			
15:20	<b>Virtual Cloud Chamber</b> J. Magill	Exercises	5
16:00	<b>Gamma Dosimetry &amp; Shielding (D&amp;S)</b> J. Magill	Exercises	6
17:00 – End of session			

### 4. Oct. – Advanced Nucleonica Applications

8:30	<b>e-Ship: Radiological Transport Assistant</b> Y. Donjoux (CERN)	Exercises	7
10:00 – Coffee			
10:20	<b>webKORIGEN: nuclide depletion calculations</b> J. Zsigrai (ITU)	Exercises	8
11:20	<b>Gamma Spectrum Generator</b> J. Zsigrai	Exercises	9a
12:30 – Break			
13:30	<b>Gamma Libraries</b> J. Zsigrai	Exercises	9b
14:30	<b>Wiki, Forum, Blog, Glossary: Knowledge Objects</b> Z. Soti	Exercises	10
15:00 – Coffee			
15:20	<b>Working with Reference Materials in Nucleonica</b> Z. Soti	Exercises	11
16:00	<b>Nucleonica Tips &amp; Tricks</b> J. Magill		
16:15	<b>Feedback/Questionnaire, Certificate</b>		
16:30 – End of Training Course			
Supplementary material (additional exercises)			12

## Forthcoming training courses...

Oct. 2013: Nucleonica - Basic, Core and Advanced Applications  
*To be held at the IRMM JRC Geel, Belgium*

Oct. 2013: Introduction to Nucleonica - Core Applications and Tools,  
*to be held in CERN, Switzerland*

Nov. 2013: Nucleonica for New comers  
*to be held at Insitute for Transuranium Elements, Karlsruhe*

Nov. 2013: Nucleonica for Nuclear Security  
*to be held at the Federal Office for Radiaton Protection (BfS), Berlin*

April 2014: Introduction to Nucleonica - Core Applications and Tools,  
*to be held in KIT/FTU, Karlsruhe*

*For more information see our webpage...*

<http://www.nucleonica.com/wiki/index.php/Category:Training>



We can also arrange a dedicated  
Nucleonica training course for  
your organisation...

Contact us at  
[info@nucleonica.com](mailto:info@nucleonica.com)

# Thank You!